Analysis and Thurstonian Scaling of Applicability Scores

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Goal

Analyze and interpret applicability scores by testing for and scaling differences

Challenge

How to obtain scale means from applicability scores

Applicability scoring is referred to as a "forced choice" version of CATA in the survey literature.

Sample items from a typical questionnaire

Read the phrases and, for each phrase, mark the box to the left if the phrase describes the product tested. Mark the box on the right if the phrase does not describe the product tested.

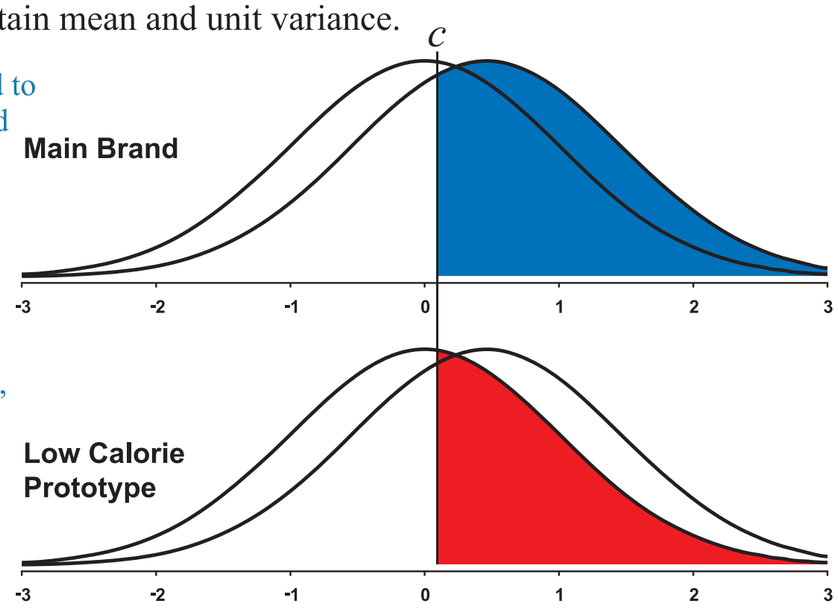
	Does Apply	Does Not Apply
I like this product	☐	☐
Has a lasting aftertaste	☐	☐
Causes salivation	☐	☐
Tastes spicy	☐	☐
Tastes very salty	☐	☐

In a Thurstonian model, we assume that each percept is randomly drawn from a distribution with a certain mean and unit variance.

One product is assumed to have a mean of zero and the other a mean of δ.

A criterion, c, is placed on the attribute axis.

If the percept exceeds c, the subject responds "does apply," otherwise the subject responds "does not apply."



Underlying distributions that give rise to the four possible response patterns. Shaded areas correspond to the probability that a product is liked.

Applicability counts based on *"I like this product"*

Low Calorie Prototype

Main Brand	DOES APPLY	DOES NOT APPLY	
DOES APPLY	88 n_{11}	104 n_{12}	192
DOES NOT APPLY	50 n_{21}	58 n_{22}	108
	138	162	300

McNemar's Test

$\chi^2_1 = (104\text{-}50)^2/154 = 18.94,\ p < 0.0001$

Applicability score frequencies for *"I like this product"* and predicted results for $c = 0.1$ and $\delta = 0.46$

Cell	Observed	Predicted
Applies to Main Brand but not Prototype	104	103.74
Applies to Prototype but not Main Brand	50	49.62
Applies to Both	88	88.43
Applies to Neither	58	58.2

Applicability scoring is a powerful way to detect and scale differences

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